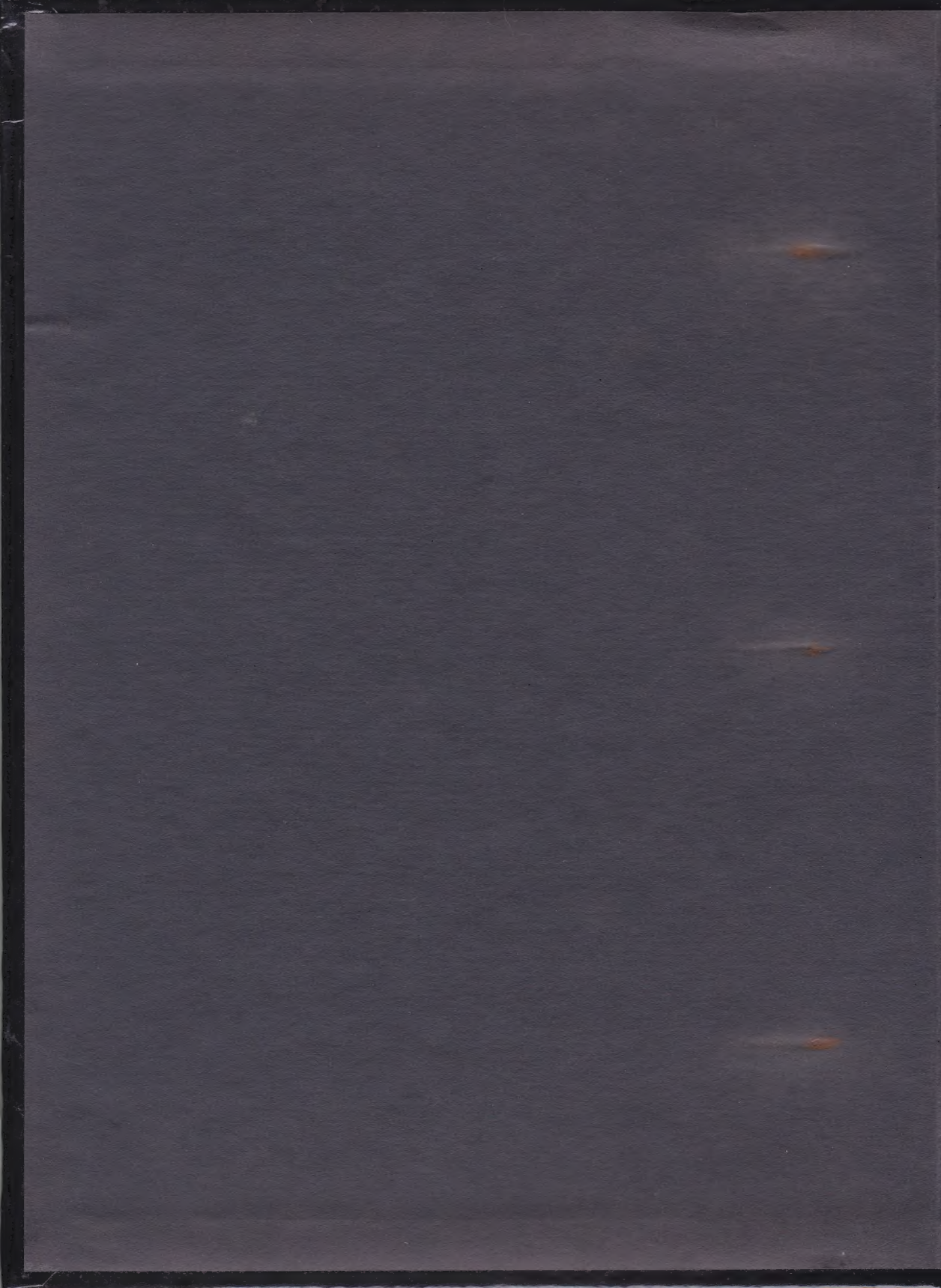


BRAINSTORM



USER'S GUIDE

How to get the most out of your Macintosh™



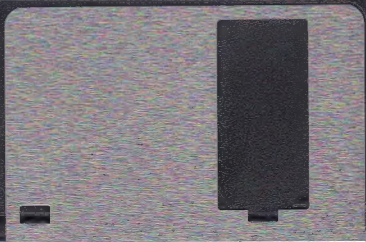
BRAINSTORM



Accelerator System Software

2.0

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BRAINSTORM



USER'S GUIDE

How to get the most out of your Macintosh™

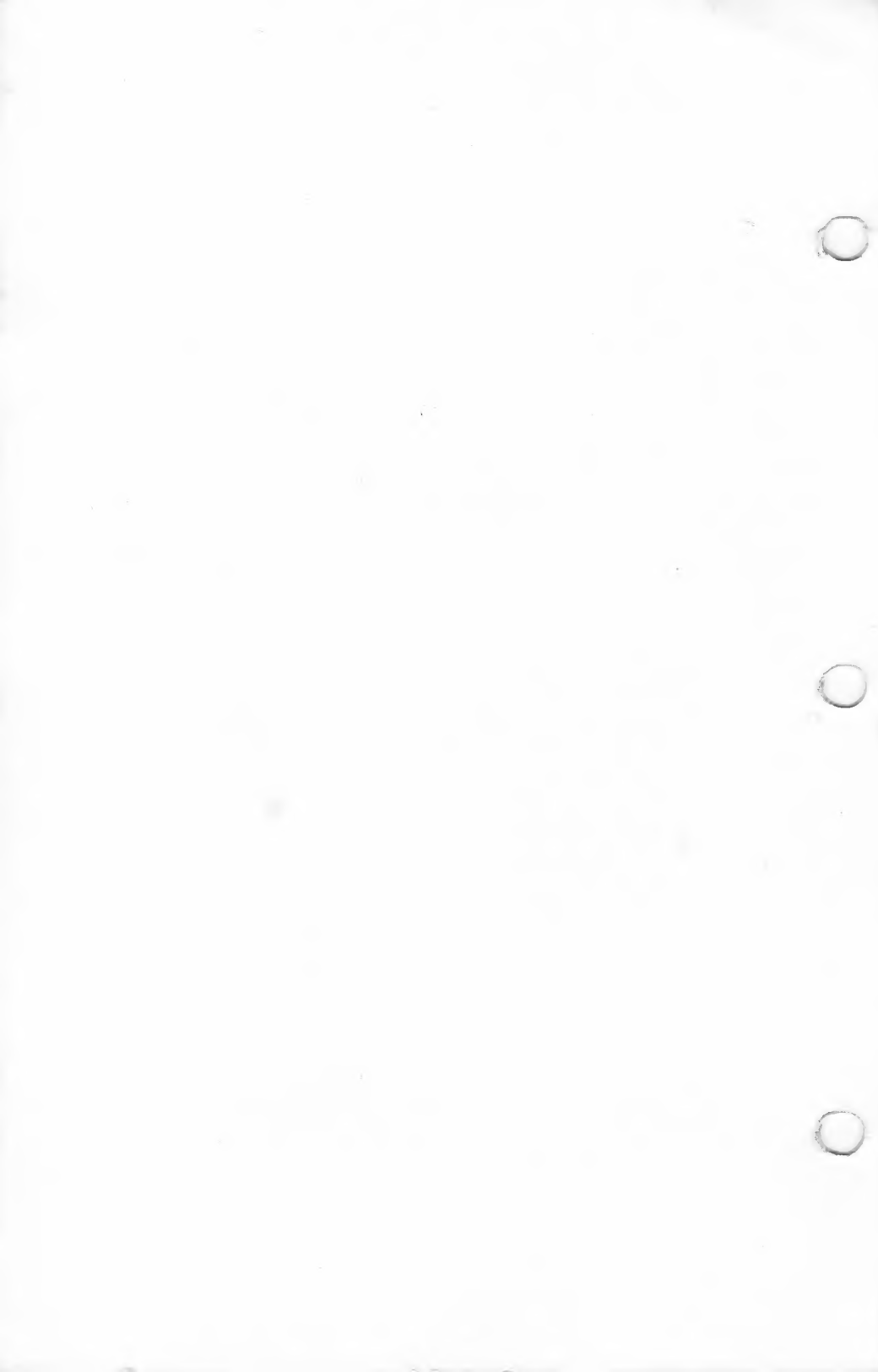


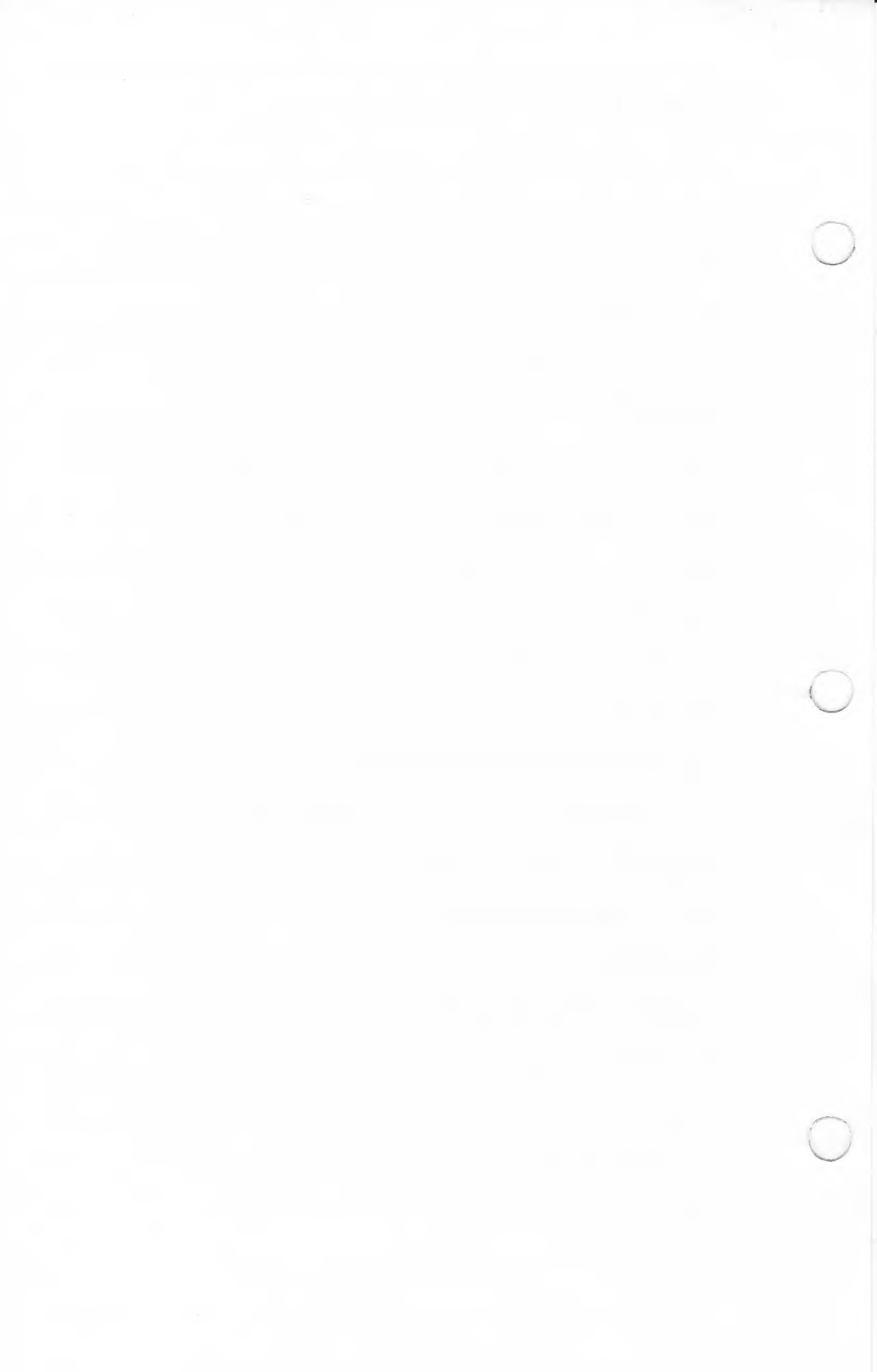
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1 INTRODUCTION

1.1 Accelerator Features

Congratulations on your decision to add a Brainstorm Accelerator to your Macintosh Plus computer. Here is what you can expect as a result of this enhancement:

- Faster graphics.
- Increased SCSI disk performance.
- Faster computations.
- Faster printing and networking.
- Programs should operate in the same way as on a standard Macintosh Plus, except for their increased speed.

You will know that your Accelerator has been installed if you see the Brainstorm logo when you turn on the power to your Mac Plus.*



Fig 1-1 Brainstorm Logo

* Accelerators manufactured prior to December 1991 may not display the Brainstorm logo until their firmware has been updated for the first time. This procedure is described in the *Brainstorm Software Installation* section of this manual.

Installation Warning



This guide does not cover the installation of the Accelerator hardware. Hardware installation is covered in the *Brainstorm Accelerator Dealer Installation Manual*. Hardware installation requires special tools and skills, and should only be performed by a Brainstorm-authorized dealer.

Please contact Brainstorm at (415) 964-2131 if you need a local dealer to install your Accelerator. Installation by an unauthorized person will void your warranty.



For full compatibility the Brainstorm Software should be installed when the Accelerator is first added to the Mac Plus. Failure to install the Brainstorm Software may result in problems with the keyboard, AppleTalk and sound. See the *Brainstorm Software Installation* chapter of this guide for the correct installation procedure.

1.2 Theory of Operation

The Brainstorm Accelerator combines three methods to increase the speed of a Macintosh Plus computer:

- A high performance CMOS 68000 microprocessor operates at double the speed of the chip on a standard Macintosh Plus—16MHz instead of 8MHz.

This halves the time required for calculation intensive tasks such as recalculating a large spreadsheet.

- A proprietary Brainstorm Bus Accelerator™ chip replaces the standard bus timing chip, doubling the speed of data transfers on the Macintosh Plus motherboard.

This streamlines transfers between the microprocessor and the ROM, the RAM and the SCSI port. Disk access and graphics benefit especially from this acceleration technique.

- In order to achieve a further measure of performance, the internal bus timing is refined. This allows overall speed to more than double.

The combination of these three factors produces a balanced overall gain in speed. The exact acceleration will vary from application to application, and also be affected by the hard disk and system software. In general, however, the accelerated Mac Plus outperforms a standard Macintosh II or Macintosh LC. Hard disk access should roughly double in speed (assuming that the disk can keep up with the computer). Graphics should triple in speed, and other Macintosh operations should double in speed.

All of this gain in performance is achieved without compromising application compatibility, thanks to the use of a 68000 microprocessor. Except for its faster speed, it operates identically to the original chip used in the standard Macintosh Plus.

The faster CPU speed can cause some Macintosh system software to fail if it depends on 8MHz timing. This issue is flexibly handled by including firmware on the Accelerator's CPU board. So as to accommodate future System upgrades, the firmware is reprogrammable. In fact it is automatically verified and updated every time the Brainstorm Installer runs.

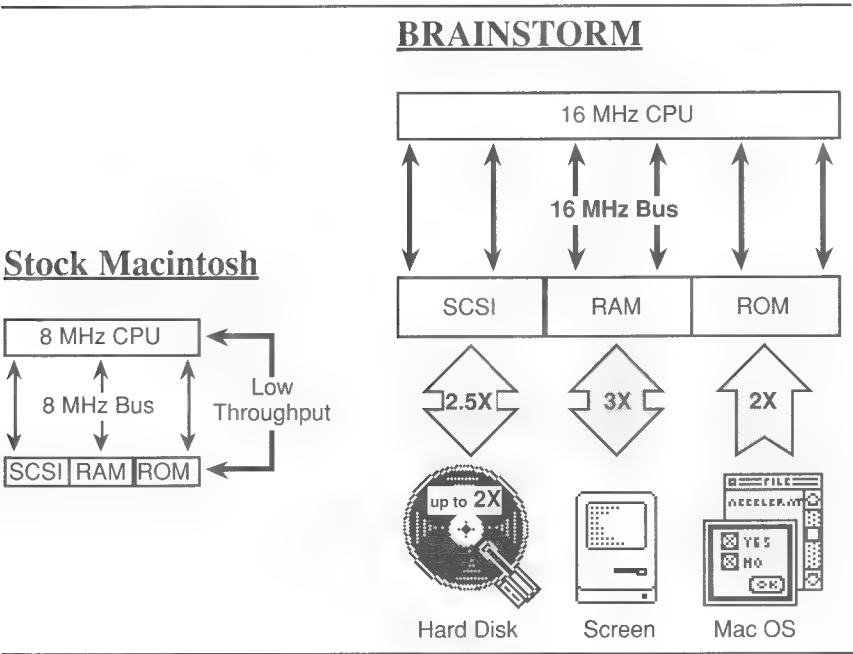


Fig 1-2 Bus Acceleration™

1.3 System Requirements

The Brainstorm Accelerator works on any Mac Plus, as long as the following conditions are met:

- A) **Brainstorm Accelerator compatible RAM memory SIMMs¹ have been used.** This point should be ascertained by the technician installing the Accelerator.

1MB, 2MB, 2.5MB and 4MB of RAM memory are supported. Not all SIMMs operate reliably with the Brainstorm Accelerator. In particular, the SIMMs must be rated at 120 ns or faster.² This rating is not sufficient in itself, however, to guarantee reliable operation.


If you suspect memory-related failures, consult the Troubleshooting chapter of this guide and your Brainstorm Authorized Dealer or the *Brainstorm Dealer Installation Manual*.

Performance of the Macintosh Plus will be enhanced by installing 2MB or more of memory. System 7 requires a minimum of 2MB.

Brainstorm recommends that 4MB of memory be installed for maximum performance.

¹SIMM: Single In-Line Memory Module. The acronym for the RAM memory boards used in Macintoshes since the Mac Plus.

²The speed of memory SIMMs is measured in nano-seconds (ns). The faster the SIMM, the smaller the number of nano-seconds. For example, 80ns is faster than 120ns. Most SIMMs include a suffix in their part number to indicate their speed. For example, -12 may be written on 120 ns SIMMs, or -08 on 80ns SIMMs.

- B) **System Software version 6.0.4 or later is used to boot up.** To determine the System Software version, select "About the Finder..." from the  menu when you start up your computer.

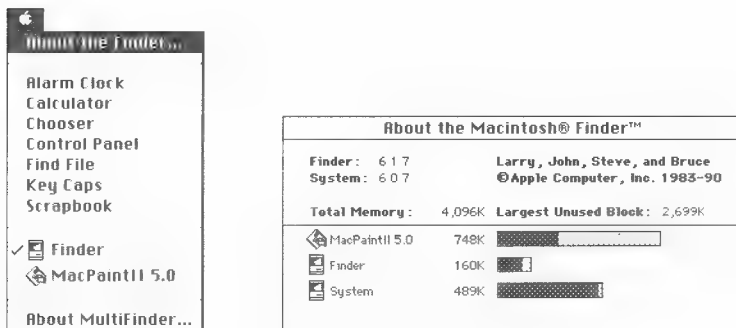


Fig 1-3 Finder Info Shows System Version



If the System version is absent, you may have a very old System installed. See the *Macintosh System Software Installation* chapter of this guide regarding updating to 6.0.4 or later.

- C) No full- or two-page displays are supported.
- D) Only SCSI hard disks are supported. Serial hard drives, including Apple's original HD-20, are not supported. SCSI hard disks plug into the Macintosh SCSI port. See figure 1-4.

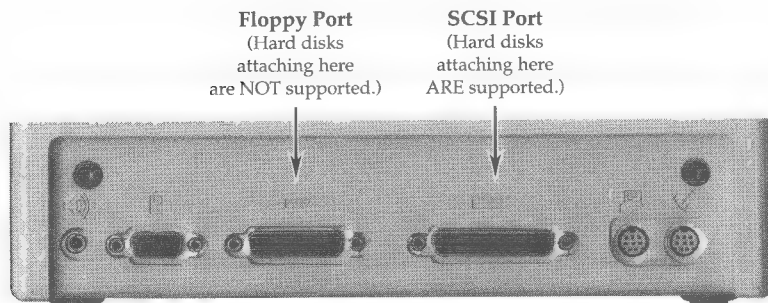


Fig 1-4 Macintosh Plus Back Panel

Operating the Brainstorm Accelerator Without a Hard Disk

While it is technically possible to operate a Brainstorm Macintosh Plus with two floppy disk drives, a hard drive increases performance dramatically and is recommended in almost all situations.

Operation with the Accelerator requires System 6.0.4 or later, which may be difficult to fit on floppy disks. System 7 does not support operation without a hard drive.

1.4 Application Software Compatibility

The Brainstorm Accelerator uses the same type of microprocessor (68000) as the standard Mac Plus. There is neither a coprocessor chip nor a memory management unit that might introduce application software incompatibilities. The speed gain of the Brainstorm Accelerator is due to its proprietary Bus Acceleration™ chip and to the faster (16MHz) CPU that it uses. This technology virtually guarantees that all software following Apple's programming guidelines will run properly with a Brainstorm Accelerator.

See the Read Me file included with your Brainstorm software disk for an up-to-date compatibility listing.

1.5 QuickStart Installation Guide

This guide is written for people who are already familiar with basic Macintosh skills, such as executing menu commands, pointing and clicking. If you are new to the Macintosh, refer to the *Macintosh Reference Manual* and introductory training materials provided by Apple.

If you are an experienced Macintosh user and prefer not to read this entire guide, you may complete your Accelerator installation by following these steps:

- 1) Update your system software to System 6.0.4 or later. Note that a number of Sound Manager fixes were incorporated into System 6.0.7, so if you want to run software that uses sounds, upgrade to System 6.0.7 or later. For detailed instructions, see the chapter *Macintosh System Software Installation*.
- 2) Run the Brainstorm Software Installer. It will verify the Accelerator firmware and, if necessary, update it. It will also install Brainstorm Software into your System Folder, and Brainstorm resources into your System File. For detailed instructions, see the chapter *Brainstorm Software Installation*.

Nothing more is needed to install the Brainstorm software. The *Optimization* chapter suggests ways to further enhance the speed of your accelerated Macintosh Plus. The *Troubleshooting* chapter is designed to address any problems that you might encounter.

Enjoy using your accelerated Macintosh Plus!

1.6 Operating the Brainstorm Accelerator

Once the Brainstorm Software has been installed, there is nothing to do except operate the Macintosh Plus in the usual way.

There is no way, short of opening up the Macintosh Plus and removing the Accelerator from the CPU board, to disable the Accelerator¹. It is always enabled².

The Brainstorm Software only serves to ensure full compatibility and to allow troubleshooting. Even without the software, the Accelerator operates at full speed.

There are no switches or Control Panel settings to select.

There are no special plugs or adapters. All peripherals connect to the Macintosh Plus just as they did without the Accelerator.

The Brainstorm Control Panel

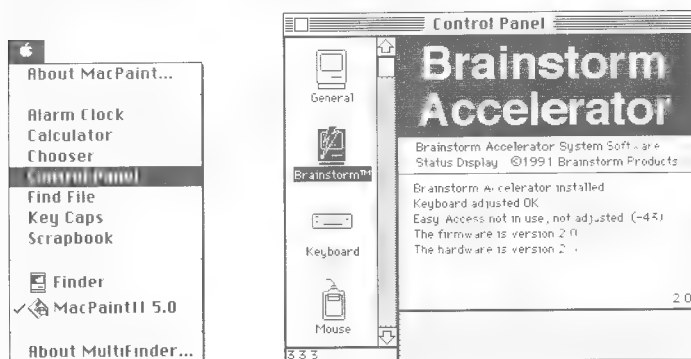


Fig 1-5 Control Panel

¹Removing the Brainstorm CPU is not sufficient to revert to regular Macintosh Plus operation. It is also necessary to reinstall the TSM chip that was replaced by a BBA chip during installation of the Accelerator hardware. Removing these items will invalidate the Brainstorm warranty unless the work is performed by a Brainstorm authorized installer.

²There is a way to disable the Accelerator's firmware. This is only used for troubleshooting, and may damage files on your hard disk if used improperly during normal operation. Even with the firmware disabled, the accelerator operates at full speed. See the *Troubleshooting* section of this manual for further information.

The Brainstorm Control Panel is installed as part of the Brainstorm Software installation. It does not include any switches or selections. It only serves to report on the status of the Accelerator software.

If the Brainstorm Control Panel has been installed, then its icon will be displayed briefly near the bottom of the screen during startup. If the icon appears with an X drawn through it refer to the *Troubleshooting* chapter.



Fig 1-6 Brainstorm Icons

Brainstorm Control Panel Status Lines

The Brainstorm Accelerator Status line confirms that the hardware for the Accelerator is on the Macintosh CPU motherboard.

The Keyboard status line confirms that the keyboard is operational with the Accelerator installed.

The Easy Access status line reports on whether Apple's Easy Access INIT is installed. If it is installed, it will be adjusted to operate properly with the Accelerator.

The Firmware status line reports on the version of firmware installed. If the version is not available, the firmware may need to be reinstalled. Refer to the chapter *Brainstorm Software Installation* for the firmware installation procedure.

The Hardware status line reports on the version of Accelerator hardware. If the version is not available, there may be a problem with your Accelerator hardware. Re-install the firmware using the Brainstorm Installer; if the problem remains, contact your dealer.

2 MACINTOSH SYSTEM SOFTWARE INSTALLATION

2.1 Backing Up Your Hard Drive

Brainstorm recommends that you backup all hard disk files before using your hard disk on an accelerated Mac Plus.

This backup serves two purposes. First, it protects you in the unlikely case where your hard drive is incompatible with the accelerated Mac. Second, it allows you to reformat the hard drive in order to improve performance. See the chapter of this guide titled *Optimization* for further information on hard drive performance.

2.2 How to Install the System Software Using Apple's Installer Disks

The Brainstorm Accelerator requires System 6.0.4 or later. However, Apple fixed a large number of bugs in the Sound Manager with System 6.0.7, so if you care about using software that generates sounds, you should upgrade to System 6.0.7 or later.

Apple provides sets of floppy disks to upgrade system software. These disks are available from Apple authorized dealers, as well as from many user groups and electronic networks. These floppy disks include a special software program called the Installer.

Instructions on how to update your system software using the Installer program are included in the *Macintosh Reference Manual*, as well as in the *Setting Up Your Macintosh* booklet.



Using the Installer is the only reliable way to update your system software. Dragging files into your System Folder is no longer a reliable way to update system software, and has not been since System 3.2, introduced in 1986.

2.3 Replacing Corrupted System Files

If you have been experiencing problems that may be System related, it is safer to install totally new System Software than to update the existing files. This is because the Installer retains parts of the existing System files when updating, so if that a file has been damaged, the updated file may remain corrupted. Examples of such problems are difficulty installing applications, system crashes, printing problems, or hard disk not booting.

To install totally new System Software:

- 1) Use Apple's Font DA Mover software to salvage your fonts and desk accessories from the existing System file. See the *Macintosh Reference Manual* or *Macintosh Utilities Manual* for directions on how to use the Font DA Mover software.



With System 7, Font DA Mover is no longer necessary. To salvage fonts, simply double-click on the System file. It will open up, showing all of the installed fonts, keyboard layouts and sounds. These can be dragged out to a folder for safekeeping. In System 7, desk accessories are not kept in the System file.

- 2) Restart the computer using the Installer Disk for the System that you want to install.

- 3) Throw all of the old Apple files, including the System and the Finder, from your System Folder into the trash. Keep only those files from third party vendors, such as Word Settings and After Dark™.
- 4) Follow Apple's instructions to use the Installer program to install new System files on your hard disk. Use System version 6.0.4 or later.
- 5) After using the Installer, copy any utility programs and files that you need, such as the Font DA Mover and Disk First Aid from the Installer Utility Disks on to your hard disk. These programs are not automatically updated by the Installer.
- 6) Use Apple's Font DA Mover software to reinstall the fonts and desk accessories that are missing from the new System. Do not replace any fonts or desk accessories that the Installer has already provided; they may be of a later version than those that you saved.

2.4 Resetting the Control Panel and Chooser

When the Accelerator was installed on your Mac Plus motherboard, some Control Panel settings and Chooser settings were lost. This is because they were stored in an area of memory powered by the Mac Plus battery (known as "PRAM"), and the cable to the battery was briefly disconnected.

After the Accelerator has been installed, you should check the Control Panel settings, such as time, date, speaker volume, and mouse speed. You should also reset the Chooser selection. Your Macintosh manuals document the required procedures.

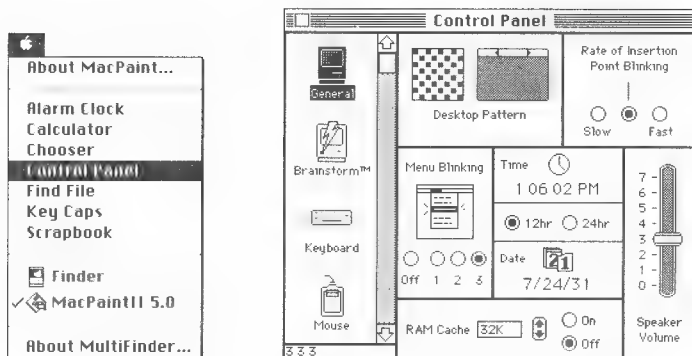


Fig 2-1 Resetting the Control Panel Selections



If the Chooser is not reset, and a printer such as an ImageWriter is directly connected to the printer port, a stream of characters will print when the Macintosh Plus is turned on.

To fix the problem, turn off the printer and reset the Chooser selections to:

AppleTalk Inactive

Printer Port (selected)

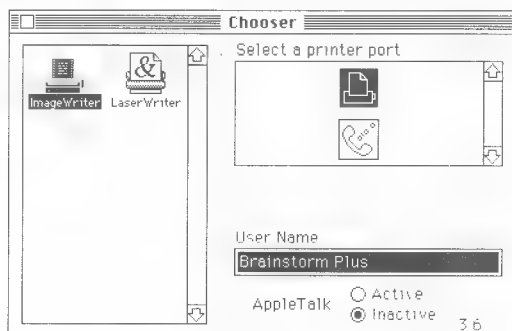
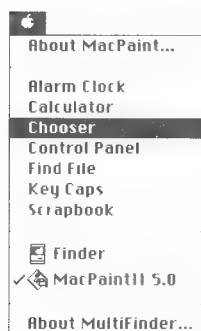


Fig 2-2 Resetting the Chooser Selections

3 BRAINSTORM SOFTWARE INSTALLATION

This chapter describes the procedure for installing Brainstorm Software on your hard disk, and updating the Brainstorm Accelerator firmware.



For full compatibility the Brainstorm Software should be installed when the Accelerator is first added to the Mac Plus. Failure to install the Brainstorm Software may result in problems with the keyboard, AppleTalk and sound.



The Brainstorm Software **MUST** be reinstalled whenever the Apple System Software on the hard disk is updated. Updating Apple System Software erases the refinements that the Brainstorm Accelerator requires to avoid problems with the keyboard, AppleTalk and sound.



The System 6 AppleTalk file must be installed by the Brainstorm Installer in order to work properly. Simply dragging it over from the Brainstorm disk **WILL NOT WORK**. The Installer updates System file resources when it installs the AppleTalk file.

3.1 Contents of the Brainstorm Disk

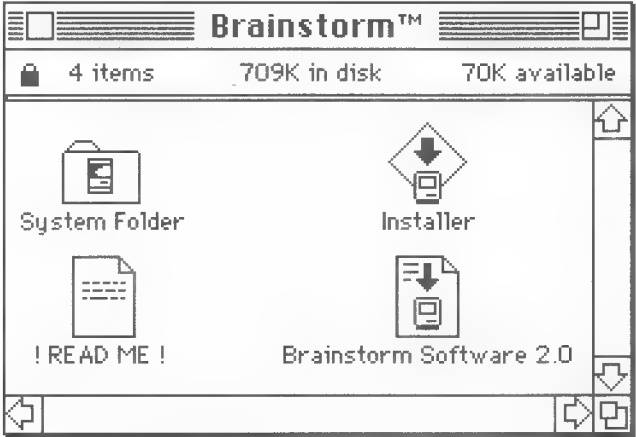


Fig 3-1 Brainstorm Software Disk Contents

Figure 3-1 depicts the structure of a Brainstorm Installer Disk. Note the Read Me file and the Installer program, which you will be asked to use during the Brainstorm Software installation process.



Files and folders should not be rearranged on the Brainstorm disk. If they are rearranged, the Installer program may not be able to find what it needs, and may abort the installation.

3.2 Opening the Read Me File

The Brainstorm Software disk includes a Read Me file that includes up-to-date compatibility information and notes related to the version of the software on the disk. Double-click on the Read Me file to open it up and read the information that it contains.

3.3 Installing the Brainstorm Software

The Brainstorm Software disk includes an Installer program that allows you to install the Brainstorm Software in the same way that Apple's System Software is installed (see *Macintosh System Software Installation* in this guide).

The Brainstorm Installer performs two tasks:

- 1) It checks that the firmware on the Accelerator is current, and if necessary updates it to the current version¹.
- 2) It installs the Brainstorm Control Panel device and other Brainstorm software into the System Folder of your hard disk. You can install this software into as many hard disks as you use to boot your Mac Plus.

Running the Brainstorm Installer

Follow this procedure to run the Brainstorm Installer:

- 1) Shut down and turn off the Mac Plus.
- 2) Insert the Brainstorm Software Disk into the floppy disk drive on the Mac Plus.
- 3) Turn on all hard disks and any other SCSI peripherals attached to the Mac Plus (scanners, printers, tape backup units, etc.). Wait a few seconds for the hard disk(s) to spin up to speed.
- 4) Turn on the Mac Plus. Observe the startup sequence (the startup sequence is described in the *Troubleshooting* chapter of this guide). If this sequence executes correctly, you will see the Macintosh desktop after a minute or so.

¹The firmware is stored in chips on the CPU board.

Note that the icon for the Brainstorm floppy disk appears in the upper right hand corner of the desktop screen. If you have hard drive volumes connected to your Mac Plus, their icons should appear below the Brainstorm floppy disk.

If this startup sequence does not execute properly, refer to the *Troubleshooting* chapter of this guide for a detailed description of the events that take place at startup. Use this information to identify which part of the process is breaking down.

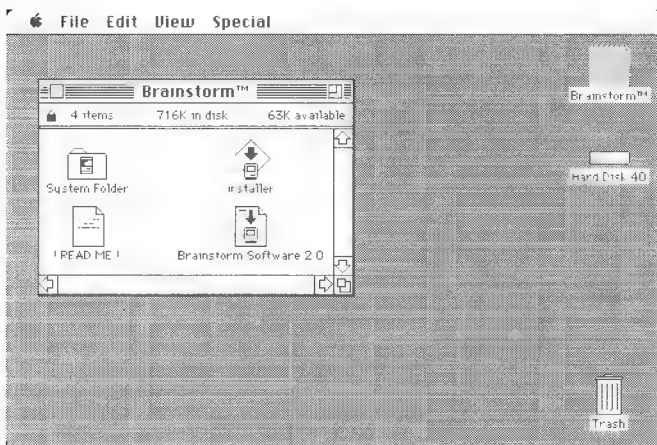


Fig 3-2 Brainstorm™ Disk on the Desktop

- 5) Double-click on the Installer icon, launching the Installer. After a minute or so the Installer welcome screen will appear.

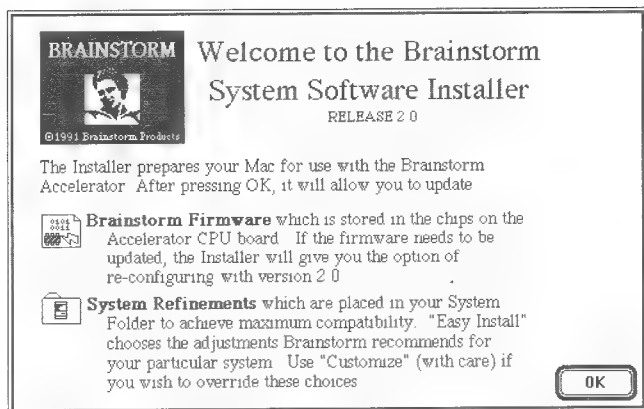


Fig 3-3 Installer Welcome Screen

- 6) Click on the **OK** button. The Installer checks to see if the firmware in the Accelerator is up-to-date.

If the Accelerator firmware is out of date, or if it has been corrupted somehow, you will be asked if it is OK to update it. Unless you have some special reason not to do so, you should click on the **Update** button in this case.

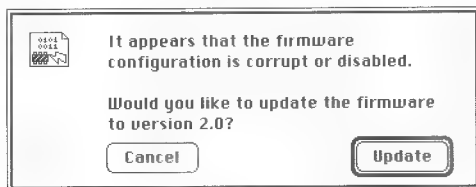


Fig 3-4 Firmware Corrupted

The update takes a few seconds, and then the Installer will tell you to restart your Mac Plus for the firmware changes to take effect. You do not need to restart immediately, however; you may continue with the installation procedure. Click on the **Continue** button, and install the remainder of the Brainstorm Software, but be sure to restart before using any other programs.

- 7) Now the Easy Install screen is displayed. The Installer examines your hard drive and lists the recommended files and resources to be installed in your System Folder.

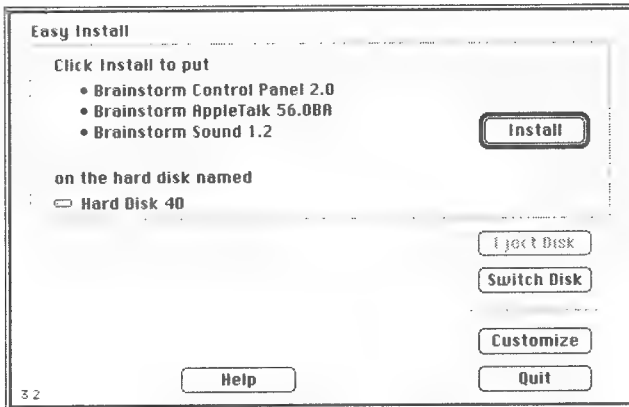


Fig 3-5 Installer Easy Install Window

Note: Make sure that the correct hard disk volume is selected for software installation. If not, click on the **Switch Disk** button until the correct disk is shown.

Optional: If you are not satisfied with Easy Install's choice of files and resources to install, and if you are an expert user, you may want to select the **Customize** option. This gives you control over the tasks that will be performed by the Installer, allowing you, for instance, not to install the Sound refinement, or to install only the AppleTalk Responder program. Do not select **Customize** unless you understand what these items are and want to modify the recommended installation.

- 8) To install the Brainstorm Software, click on the **Install** button. The Installer then removes obsolete files and resources and installs new ones. When it has finished, the Installer informs you that the installation was successful. Unless you want to

install Brainstorm Software on other hard disk volumes, click on **Quit**.



Fig 3-6 Installation Successful Screen

This completes the installation of the Brainstorm Software. You should now **Restart** the Mac Plus.



Fig 3-7 Restart Command

4 OPTIMIZATION

This chapter is designed to assist you in achieving the maximum performance from your accelerated Mac Plus.

4.1 RAM Memory

In general, the more RAM memory that is installed in a Mac Plus the faster it operates. Adding RAM up to the maximum of 4MB allows software to run with a minimum of hard disk access, often increasing performance.

4.2 Hard Disks

Adding a hard disk to the Mac Plus will greatly improve its performance and flexibility. It will also ease the use of recent versions of Apple's system software which require considerable disk space.

The Brainstorm Accelerator supports only SCSI hard drives. These are ten to fifteen times faster than the serial models that were sold for the Macintosh in the early days. Brainstorm recommends the use of fast, late-model drives with built-in data caches which will take advantage of the Accelerator's high-speed SCSI channel.

There has been a steady increase in the speed of SCSI hard disks, and recent models are often four to eight times faster than higher priced models of a few years ago. Investing in a larger, faster hard disk is one of the best way to speed up your Macintosh. The fastest hard drives will have the lowest access times and allow 1:1 interleaving (see the section titled *Hard Disk Interleave*).

4.3 Opting to Omit Brainstorm Software

Advanced users may choose to omit some of the Brainstorm Software installed automatically by Easy Install. In some cases this may result in faster operation. The following paragraphs describe how to do this.

Removing the AppleTalk File in System 6.

If you are using System 6, you can save a few seconds at startup time by removing the AppleTalk file from the System Folder. This file takes several seconds to load each time the Macintosh Plus boots. It also occupies a small amount of system heap memory. Removing it will increase available memory slightly and improve the performance of programs and background tasks.

If you ever plan to connect your Macintosh Plus to an AppleTalk network, you will want to keep the AppleTalk file in a separate folder so that it can be easily returned to the System Folder. The accelerated Macintosh Plus will not operate properly on an AppleTalk network without the Brainstorm AppleTalk file installed. If you do not save the AppleTalk file, the Brainstorm Installer may be used at a later date to re-install AppleTalk.



The System 6 AppleTalk file must be installed ORIGINALLY by the Brainstorm Installer in order to work properly. Simply dragging it over from the Brainstorm Software disk WILL NOT WORK. This is because the Installer also updates System file resources when it installs the AppleTalk file.

In System 7 no AppleTalk file is placed in the System Folder. Some AppleTalk resources are installed directly into the System file, but they are only accessible with

advanced programming tools and should not be tampered with.

Removing the Responder File in System 6.

If you are not on an AppleTalk network, you can save a few seconds at startup time by removing the Responder program from the System Folder if it is there. In addition, removing it may slightly improve the performance of background tasks.

Responder occupies a small amount of system heap memory. Removing it will make more memory available for other extensions and programs.

Responder need not be installed with System 7, as System 7 already incorporates Responder's features.

Removing the Brainstorm Sound File

The Brainstorm Installer may put a Brainstorm Sound file in the System Folder¹. This file allows sounds to be produced more clearly. It may be removed without affecting any other Macintosh functions.

Check the release notes to see if removing the Brainstorm Sound file will increase your Accelerator's performance.

Removing the Brainstorm Control Panel Device

The Brainstorm Installer puts a Brainstorm™ file in the System Folder. This file causes the Brainstorm™ module to appear in the Control Panel. Additionally, it ensures

¹The current version of the Installer as of this writing places a Sound file in the System Folder. This functionality may at some time in the future be incorporated into the Accelerator's firmware, rendering the Sound file unnecessary.

that the keyboard works properly when Apple's Easy Access program is also present in the System Folder.

Removing the Brainstorm™ file will save a few seconds when you startup the Macintosh, and also allow the Control Panel to open a little faster.

The Brainstorm™ file occupies a small amount of system heap memory. Removing it will make more memory available for other extensions and programs.

If you remove the Brainstorm™ file, then the Easy Access file must also be removed from the System Folder. Otherwise the keyboard may not work correctly.

4.4 Hard Disk Interleave

When a hard drive is formatted, an **interleave factor** is set that allows it to work as fast as possible on the model of computer to which it is connected. Accelerating the Macintosh Plus may allow you to reformat your hard disk with a lower and faster interleave factor.

The interleave factor describes how the sectors of the hard disk are laid out around each track. With 1:1 interleave, the sectors follow each other one by one. With 2:1 interleave, a physical sector is skipped between each logical sector, so as to leave the computer and the disk controller a little extra time to accomplish the transfer of each sector. With 3:1 interleave, two physical sectors are skipped between each logical sector, allowing even more time. Higher interleave factors skip more sectors.

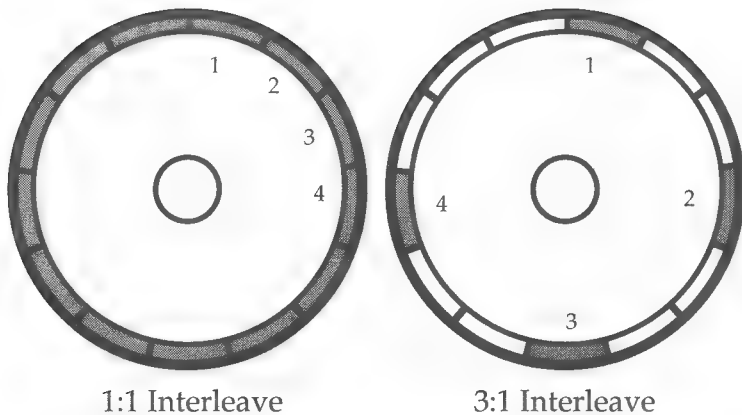


Fig 4-1 Interleave Factor

Some hard drives require interleave settings of 4:1 or higher for the Macintosh Plus, whereas some can support the fastest 1:1 setting. In general, the lower the interleave, the faster the drive will operate *as long as both the drive controller and the Macintosh can handle the speed*. However, if you format the disk with a lower interleave factor than the computer and the drive can handle, the disk slows down enormously.

To see how the interleave factor affects performance, suppose that a program needs to read an entire track of data from a hard disk. Figure 4-1 illustrates how with 1:1 interleaving, a single rotation of the disk platter will suffice to access all of the sectors. With 3:1 interleaving, the computer has to wait for three rotations. So 1:1 interleaving may be up to three times faster.

Imagine, however, that the computer could only handle 2:1 interleaving and was nonetheless formatted 1:1. Each sector, except for the first, rotates too far to be read by the time the computer is ready for it. Now the computer has to wait for each sector for an entire rotation until it again passes beneath the read heads. The disk illustrated in Figure 4-1 would need to rotate 16 times to read the

entire track, instead of only twice with 2:1 interleaving. This is why choosing too low an interleave factor drastically reduces performance.

The fastest interleave setting for your hard disk depends upon many factors, including the disk mechanism, the disk controller board, the hard disk software drivers, and the speed of the Macintosh Plus.

Following are guidelines for determining the fastest interleave factor for your hard disk:

- In no case should a higher interleave factor need to be set for the drive than was recommended by the manufacturer for a standard Macintosh Plus. If 1:1 is the standard setting, you may keep it.
- Drives with an on-board RAM cache which is large enough to hold a full track of data can usually operate at a 1:1 interleave factor. To see if your drive includes this feature, you need to determine which mechanism is built into the drive's case. Disk utility software can often tell you what type of drive mechanism is present, or a qualified technician can open up the drive's case to check it visually.

Examples of drives with sufficiently large on-board caches to support 1:1 interleaving include most Quantum[™] mechanisms, Fujitsu[™] IDD series mechanisms, Wren[™] mechanisms, and late-model Maxtor[™] mechanisms.

- Most drives that normally operate with 2:1 or greater setting on a standard Macintosh Plus can operate fastest at a 2:1 setting when the Brainstorm Accelerator is installed. In a few cases the interleave factor may be reduced to 1:1. You should test the performance after you make a change to make sure that your drive is faster. You can test it by timing how long it takes to duplicate a large folder, say 5MB in size.

- The recommendations of disk utility programs may be misleading because they do not always realize that the Macintosh is accelerated. One program, for instance, asserts something like “Our tests show that an interleave factor of 3:1 is optimal for your drive on this computer.” In fact, they are consulting a table of test results established with a standard Macintosh Plus, and their recommendation may well be higher than is necessary with the Accelerator, resulting in needlessly slow performance.
- If you use more than one hard drive, you may need different settings for the different drives. Each drive should be formatted with its own optimal interleave factor.

To change the interleave setting of a hard disk:

- 1) Backup the hard disk. Changing the interleave factor requires reformatting, which will erase all of the disk’s contents, so a backup is essential if you wish to retain any data.
- 2) Use a disk formatting utility program, either from the hard disk vendor or a commercial general purpose program, to reformat the disk with a different interleave setting.



The dialogs and messages included in disk formatting utilities are often cryptic. Even experienced programmers are well advised to read the manuals for these programs. Typically, for example, the interleave setting displayed is the *proposed* interleave, not the actual interleave setting currently in use.

- 3) Restore the contents of the hard disk from the backup.

4.5 Hard Disk Driver Software

One factor that can significantly affect disk performance is the choice of the hard disk driver software.

Most users are unaware of the role played by the disk driver. They receive their hard disk formatted with a driver installed, and are unaware that driver software is controlling the disk's performance and operation.

The hard disk driver software resides on the hard disk in a special area normally inaccessible to the user. It is loaded into the Macintosh RAM memory at startup during the brief period after the memory test when the screen goes black. See Startup Sequence in the *Troubleshooting* chapter of this guide. It is later called upon when data needs to be transferred to and from the disk. Each disk connected to the Mac, and indeed each SCSI device, has its own driver, and they may be different from each other.

Most drive manufacturers revise their disk drivers from time to time in order to improve performance or to respond to changes in Apple System Software. Sometimes it is necessary to update a disk's driver so that it can work reliably with an accelerated Macintosh Plus.

Disk drivers that use a technique known as "blind transfers" tend to crash when operating with an accelerated Mac Plus. They count on the Mac Plus operating at normal speed, and the Brainstorm transfer rates can be up to five times faster than standard.



Disk drivers that use "blind transfers" may not work with the Brainstorm Accelerator.

If your driver software is older than a year or two, you may want to contact the hard disk's manufacturer to find

out if a more recent version is available. Make sure that the replacement version does not use blind transfers.

An alternative to using the drive vendor's own driver software is to purchase a hard disk utility program such as StörWare™ by Universal Mac Products Inc. or Silverlining™ by La Cie.* Such products are designed to optimize a wide variety of hard drives, and include drivers for them. Most commercial utilities either do not use blind transfers, or allow you to turn them off.

* Brainstorm Products has no connection with the named companies, and does not endorse their products or services. Brainstorm Products shall not be liable for any damages caused by these these companies or resulting from the use of their products.

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5 TROUBLESHOOTING

This chapter is designed to assist you in troubleshooting an accelerated Macintosh Plus. It includes lists of problems and recommended solutions, along with tips on how to isolate a hardware or software problem.

Some symptoms, such as the screen remaining black, which appear to be related to hardware may in fact be caused by software. The information in this chapter may lead you to the problem's source and to a solution without having to return the Macintosh to your dealer.

5.1 About Sad Mac Errors

The Macintosh will often display an error message when it fails. The error message may offer a clue about the source of the problem.

One type of error message is the "Sad Mac" display. The Sad Mac is a depiction of a frowning Macintosh accompanied by a six character error code that gives important clues in determining the source of the problem.



Fig 5-1 Sad Mac Error Display

It is important to record all six digits of the code and to determine whether the same six character code appears each time the Sad Mac occurs.

See the following sections and the isolation flowchart following this chapter for the steps to follow in the event of a Sad Mac error. Keep in mind that both hardware *and* software problems may cause a Sad Mac error.

5.2 Problem Isolation Methods

In general, careful thought and methodical isolation are the best ways to identify the source of a hardware or software problem. For example, a machine crash that causes a system error may result from:

- Corrupted system software.
- An outdated version of an application.
- Inits in the System Folder.
- A programming error.
- Old versions of hard disk driver software.
- Improper termination of the SCSI devices.
- A software virus.
- Defective SCSI cables.
- The Macintosh power supply being adjusted too low or needing other servicing.
- Oxidized contacts on the Macintosh internal power supply cable causing voltage fluctuations on the Macintosh logic board.
- A corrupted hard disk file system.
- Unreadable sectors on the hard disk.
- SIMMs that do not operate reliably with the Brainstorm Accelerator.
- A damaged Macintosh logic board.
- A speck of conductive material such as a solder flake loose in the Macintosh case.
- A missed solder joint or a poorly soldered joint in the Accelerator installation.
- A defective Accelerator.

Since any of these causes may result in similar symptoms, it is important to proceed with fault isolation methodically .

When isolating the cause of a failure it is often useful to determine whether the failure is intermittent, repeatable, or identically repeatable. All three types may be caused by either hardware or software, but they do narrow the possible causes down in each case. If you call Brainstorm or your dealer for assistance, it will help them to know into which category the symptom(s) fall.

Intermittent failures happen every now and again, but cannot be caused to happen by following a well determined sequence of actions. Intermittent failures are typically indicative of hardware problems. However, some of the more complicated software problems also manifest themselves as intermittent failures.

Repeatable failures can be caused at will by following a well determined sequence of actions, but the symptoms may look a little different each time.

Identically repeatable failures are repeatable, and furthermore the symptoms are exactly the same each time the failure occurs.

Once you have determined how repeatable the failure is, the next step is to determine whether it is caused by software or hardware. Say, for example, the problem is identically repeatable when selecting the Print command, in only one particular program. This would indicate a software problem associated with that particular program. This could be easily verified by confirming that other programs do not have the problem when selecting their Print commands.

In the above example, if it were found that other programs also had trouble printing, the problem might still be a software problem associated with the Macintosh System Software, which is common to all programs. This possibility could be checked by re-installing both the System Software and the Brainstorm Software, and then repeating the sequence of actions that causes the failure.

Alternatively, the Macintosh could be booted off a different hard or floppy disk with a known-good copy of the System Software.

Finally, suppose that in the above example, it were found that several programs continue to have the problem, regardless of the System Software in use. This would begin to indicate a hardware problem, which could be confirmed by testing the *identical* software setup on another Macintosh *of the same model*. If in this way the problem was in fact isolated to the hardware, the next step would be to determine which component of the computer system is at fault.

Possible faulty hardware components include the hard disk, the power supply, the logic board, the internal cables, the floppy drive, the RAM memory SIMMs, the printer or other peripherals, and /or the Accelerator.

Whenever you suspect that a problem may be due to the Brainstorm Accelerator, it is useful to make sure that the symptoms do not appear without the Accelerator. Since the Accelerator cannot be disabled, the only way to do this without opening up the computer is to temporarily swap the suspect Mac Plus with a standard non-accelerated Plus.

If the problem also occurs on a standard Macintosh Plus, it is not related to the presence of the Accelerator. If the problem only appears on the accelerated Macintosh Plus, then either the Accelerator or the Macintosh Plus itself is implicated.


Another good isolation technique is to disconnect the SCSI cable from the back of the Macintosh Plus, and to start up the computer with the Brainstorm floppy disk. If it appears to operate properly, then there is a good chance that the problem lies in the hard disk, the hard disk driver, or the software on the hard disk. If it does

not operate properly, then the Macintosh Plus, the RAM SIMMs or the Accelerator are probably at fault.

5.3 Initial Installation Problems


These symptoms may occur just after the Accelerator has been installed. They usually indicate that a setting was lost during the installation and, once corrected, are unlikely to recur.

The time and date are incorrect.


These settings and some others in the Control Panel are lost when the Accelerator is installed. This is because the PRAM memory where these settings are stored is temporarily disconnected from the battery while the logic board is removed. Reset them by opening up the Control Panel under the  menu.

The printer connected to the printer port prints random characters when the Macintosh is turned on.

The Chooser settings were reset to the Mac's default when the Accelerator was installed. The default is that the printer port is used for AppleTalk, and any non-AppleTalk printer such as an ImageWriter is connected to the modem port. If your non-AppleTalk printer is connected to the printer port and AppleTalk is enabled, it receives streams of data when the Macintosh is turned on.

To correct the problem, turn off the printer, open the Chooser under the  menu, and disable AppleTalk in the Chooser. Also specify that your printer is connected to the printer port, not the modem port. Then turn the printer back on. See figure 2-2.

Applications are unable to print.

The Chooser settings may have been lost when the Accelerator was installed. Open the Chooser under the  menu to reset them.

If the problems involve a printer connected via AppleTalk, the problem may be that the Brainstorm AppleTalk drivers are not installed properly. Re-install AppleTalk following the procedures in the chapter *Brainstorm Software Installation*.

5.4 Possible Hardware Problems

These symptoms may occur if there is a problem with some part of the Macintosh hardware, including the power supply, logic board, internal cables, RAM memory SIMMs, or the Accelerator installation.

The Macintosh operates properly for a while, then crashes or restarts randomly.

The first task is to determine whether the accelerated Macintosh itself is the source of the problems. If possible, try swapping the computer with another Macintosh Plus. If it also crashes, then the software, the hard disk, the cables or the power source are implicated rather than the Macintosh or the Accelerator.

If the Macintosh Plus or the Accelerator hardware appear to be the source of the crashes, contact your Brainstorm dealer for assistance. Hardware problems that may cause crashes include:

- **The power supply voltages may be low.** Ask your Brainstorm dealer to check the voltages as illustrated in the *Dealer Installation Manual*. If it is too low (below 4.85 volts) it can cause the Macintosh to crash or restart unexpectedly. In this case

the Macintosh Plus power supply probably needs to be serviced.

Wiring Harness Note that the voltage may be intermittent, remaining steady for several minutes, and then dipping suddenly. This implicates the power supply board or the wiring harness, and the Macintosh needs to be serviced.

- **RAM Memory SIMMs** may be installed that cannot operate reliably at the 16MHz speed demanded by the Accelerator. This causes crashes that are often sensitive to temperature. The Macintosh may crash when it is first turned on, or only when it has warmed up. Contact your dealer to replace the faulty SIMMs. It is also a good idea to service the power supply.
- **In some very rare cases the ROM chips on the Macintosh Plus** motherboard require that an extra device known as a ROM capacitor be added to operate reliably. A symptom of a ROM-related problem is that crashes tend to occur as you click in the Finder menu bar. Contact your dealer to add the ROM capacitor if necessary.
- **Loose solder joints** can cause crashes that are temperature and vibration related. Your Brainstorm dealer can check and repair any loose joints.

Disk insertion causes a crash.

There may be a problem with the Macintosh Plus or the Accelerator installation, such as a loose or unsoldered connection. Please contact your Brainstorm dealer.

Floppy disks cannot be read. The floppy drive motor does not spin.

The cable to the floppy disk drive may have been left disconnected when the Accelerator was installed. Please contact your Brainstorm dealer.

Distorted icons appear on the screen. Unpredictable crashes or system errors follow.

There is possibly a problem with the revision of the Apple ROM chips or with the Brainstorm ROM capacitors. Please contact your Brainstorm dealer.

System errors occur frequently when clicking on the Finder menu bar.

There is possibly a problem with the revision of the Apple ROM chips or with the Brainstorm ROM capacitors. Please contact your Brainstorm dealer.

“Snow” appears on the screen, followed by crashes.

The RAM SIMMs may be unable to work reliably with the Brainstorm Accelerator. Please contact your Brainstorm Dealer for assistance.

5.5 Brainstorm Software Not Installed

These symptoms occur when the some or all of the Brainstorm Software has not been installed, or has been lost, such as when new System Software is installed on your hard disk.

The keyboard does not work.

First verify that the keyboard cable is plugged in. If it is, then Apple's Easy Access program may be in the System Folder without the Brainstorm™ file. If Easy Access is in the System Folder, the Brainstorm™ file must also be present or the keyboard will be disabled. To fix this problem,

either remove Easy Access or add the Brainstorm™ file using the Installer on the Brainstorm™ software disk, then Restart.

If neither Easy Access nor Brainstorm™ is in the System Folder and the keyboard still does not work, there may be a problem with the Accelerator firmware. To check and verify the firmware, run the Brainstorm Installer program.

Printing via AppleTalk is very slow, or printers do not show up in Chooser window.

The AppleTalk drivers may not be properly installed. Reinstall the Brainstorm Software following the procedures outlined in the *Brainstorm Software Installation* chapter of this guide.

Sounds are distorted.

The Brainstorm Accelerator requires a Brainstorm Sound file in the System Folder to avoid distortion of some sounds. Reinstall the Brainstorm Software following the procedures outlined in the *Brainstorm Software Installation* chapter of this guide.

There are problems with network access or with e-mail.

The AppleTalk drivers may not be properly installed. Reinstall the Brainstorm Software following the procedures outlined in the *Brainstorm Software Installation* chapter of this guide.

The Brainstorm logo does not appear during startup.

If the Brainstorm logo does not appear, you may have a firmware problem, the firmware may be disabled, or you may have version 1.0 of the Accelerator hardware, which does not include firmware.

Run the Brainstorm Installer as described in the *Installing Brainstorm Software* chapter of this guide to reinstall the firmware.

If you have version 1.0 of the Accelerator hardware, you need to follow a special procedure to install Brainstorm software. Please contact your Brainstorm dealer to upgrade to a current version of the hardware, or to receive assistance in installing Brainstorm software.

The Brainstorm Installer fails to update the firmware properly. Other software cannot be installed, because the Installer insists on aborting the installation.

You may have a faulty Accelerator, or you may have version 1.0 of the hardware that does not include firmware. In either case, please contact your Brainstorm dealer for assistance.

If you have version 1.0 of the Accelerator hardware, you will need to follow a special procedure to install your Brainstorm software.



The Brainstorm icon appears at startup with an X.

There are several possible causes for this symptom:

- There may not be an Accelerator installed on this Macintosh.
- The Accelerator may be damaged.
- The System Software may be damaged. In this case re-install the Macintosh System Software.
- The Brainstorm Software may be incorrectly installed or damaged. Try re-installing the Brainstorm software.
- The System may be running out of heap memory space. This might occur if many INITs were installed. Solutions include removing some INITs, increasing RAM memory (by adding SIMMs), increasing the

starting heap size with a heap management tool, or upgrading to System 7.

5.6 Compatibility Problems

These symptoms may occur while using software (including hard disk drivers) which does not conform to Apple's programming guidelines. Often the fundamental cause of these types of problems is timing-sensitive code.

The hard drive will not boot, or the Mac crashes when accessing the hard disk.

An incompatible driver may be installed on the hard disk. In this case, there will probably be other problems such as unreliable writing to the hard disk. This can be tested by attempting to duplicate a large folder.

Contact the hard disk vendor to see if a more recent driver is available. If not, or if the problem persists, try installing drivers from a commercial disk utility package such as StörWare™ by Universal Mac Products Inc. or Silverlining™ by La Cie.*

After Dark™ crashes.

After Dark™ version 1.0 is incompatible with the Accelerator. Upgrade to a current version.

* Brainstorm Products has no connection with the named companies, and does not endorse their products or services. Brainstorm Products shall not be liable for any damages caused by these these companies or resulting from the use of their products.

5.7 The Startup Sequence

Many different problems can result in the Mac Plus not starting up as expected. Understanding the sequence of events that are executed at startup can assist you, and if necessary the Brainstorm technician supporting you, in identifying the source of the difficulties.

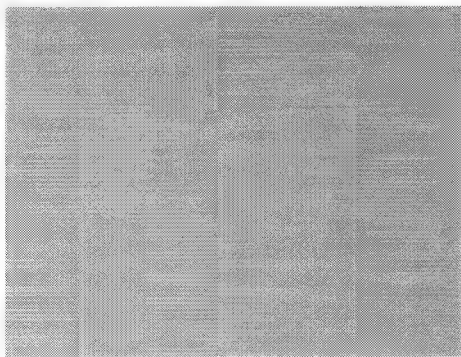
Following is a list of the events which normally happen when the power is applied to a working Macintosh Plus with the Brainstorm floppy disk in the internal drive:

- 1) The **screen is cleared**. If the Mac does not beep and displays strange patterns as soon as it is turned on, this typically means the CPU was unable to execute this first step. This could be caused by the failure of a logic board component such as a ROM chip or by a poorly soldered pin on the Accelerator CPU socket.
- 2) The **Startup Beep**. This signifies that the CPU is operating. The beep consists of a pure tone that lasts about 1 second. A scratchy beep usually indicates a memory problem. A long beep may indicate a defective LAG chip on the Macintosh Plus motherboard.
- 3) **Internal hardware tests**. The ROM, RAM and some other internal components are tested. If a test fails, a Sad Mac is displayed with a code the first two characters of which are 01, 02, 03, 04, 05 or 0F.



Fig 5-2 Sad Mac Error Display

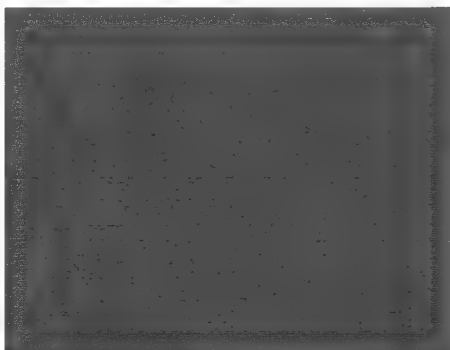
- 4) A featureless **gray screen** that remains steady for up to 14 seconds, depending upon how much RAM memory you have installed.



This pattern is displayed while the Mac runs through an extensive RAM memory test. The more RAM installed, the longer it takes. This is your first sample of the speed of the Brainstorm Accelerator; on a standard 4MB Mac Plus the memory test takes 30 seconds.

White dots, streaks or thin vertical lines during this test indicate a hardware problem. If you see any such occurrences, contact your dealer.

- 5) A brief **black screen**. This is the point at which the firmware on the Accelerator is tested, and the SCSI bus is searched for devices. Any devices found have their drivers loaded into memory and executed.



If a hard disk driver crashes at this point, a Sad Mac display may result. It typically would begin with 0F. Other behavior may also occur, such as crackling noises and random or unstable displays, or simply a frozen black screen.

- 6) The **Brainstorm logo** This window confirms that the Accelerator firmware is installed and tested, and shows the firmware version.



Fig 5-3 Brainstorm Logo

If the logo does not appear, either the firmware needs to be updated or there is a hardware problem. In either case launch the Brainstorm Installer and update the firmware.

- 7) The **Brainstorm startup screen**. The startup image is loaded from the System Folder of the Brainstorm floppy disk. This screen displays the version of the Brainstorm disk at the lower right.

While the startup screen is displayed, additional icons will appear in the lower left corner as each startup file loads. Release 2.0 of the Brainstorm floppy displays the icons for the Brainstorm Control Panel file and Responder.

The Responder icon may have a large X over its icon, if AppleTalk has been previously turned off on this machine; this is not necessarily a problem.

An identically repeatable (having the same symptoms on each boot) crash at this point usually indicates a corrupt floppy disk or a defective

floppy drive. Random, unrepeatable crashes at this point usually indicate a memory, power supply, or other hardware problem.



Fig 5-4 Brainstorm Startup Screen

- 8) The **Macintosh desktop** appears. If any hard disks are attached, their icons should appear below the floppy icon indicating they are available for use.

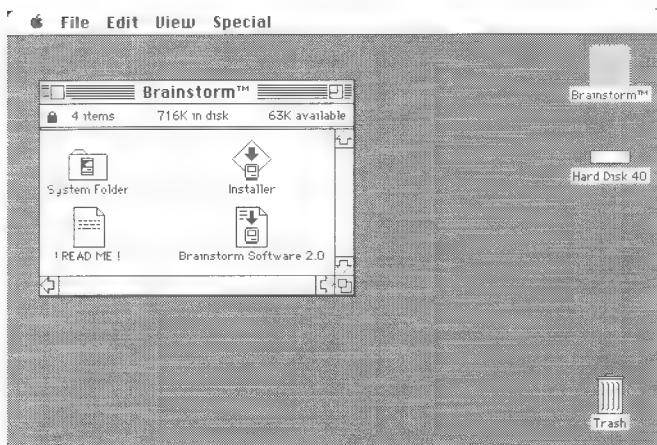


Fig 5-5 Brainstorm™ Disk on the Desktop

If a hard disk's icon does not appear on the desktop, or if the Mac crashes after displaying the floppy icon, the hard disk may have incompatible driver software. See the *Troubleshooting* chapter.

5.8 Disabling the Accelerator Firmware

If the Accelerator firmware has become corrupted, a variety of problems may occur including difficulties with SCSI devices or a “Sad Mac” display upon power-up.

To prevent users from operating with corrupted firmware, versions 1.3 and later of the Brainstorm Accelerator firmware incorporate a self-diagnostic test which displays a Sad Mac error if there is a firmware problem. These Sad Mac errors are distinctive—their six-digit error code always begins with the two digits 00.

The only way to fix the firmware is to run the Brainstorm Installer program, but it cannot be run if the firmware diagnostics test displays the Sad Mac at startup, since the Mac will not boot up in this mode. To work around this, the Accelerator has a firmware disable function to allow booting off the Brainstorm floppy.

To disable the Accelerator firmware in the event of a “00” Sad Mac or for other testing purposes, follow the procedure below. Be warned, however, that if the firmware is disabled with hard drives connected, files may be corrupted. This is because the firmware affects the way in which SCSI devices are controlled.



Avoid disabling the Accelerator firmware while SCSI devices such as hard disks are connected to the Macintosh Plus. Doing so may endanger files and equipment.

Even if you disable the firmware the Accelerator will continue to operate at full speed.

To disable the Accelerator firmware:

- 1) Turn off the Macintosh Plus and **all** SCSI peripherals connected to it.
- 2) If there are any SCSI hard disks attached, unplug the cable that connects them to the Mac.
- 3) With the SCSI peripherals off and disconnected, turn on the power to the Mac.
- 4a) If the programmer's switch is installed at the lower rear of the left side of the Mac Plus, depress BOTH of its buttons at the same time, and then let them both go at the same time.

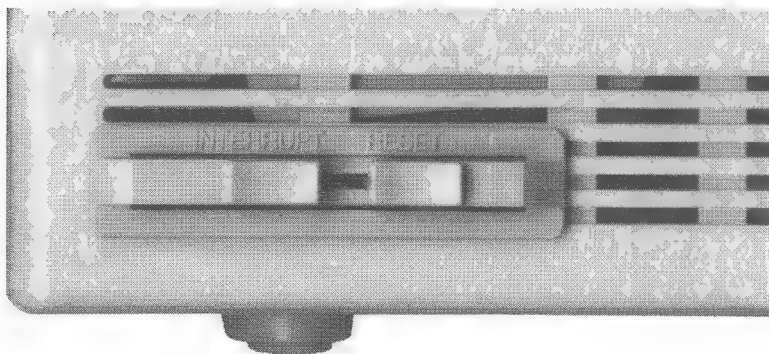


Fig 5-6 The Programmer's Switch

- 4b) If there is no programmer's switch installed on the Macintosh Plus, you can depress the two buttons that the switch connects to by using a stiff piece of plastic or cardboard and slipping it into the slot where the switch goes.
- 5) The Macintosh Plus will now restart with its firmware disabled. The Brainstorm logo will not be displayed during startup. If you previously saw a Sad Mac with a 00xxxx code, it should not be displayed with the firmware disabled.
- 6) You can now reinstall the firmware if necessary using the Brainstorm floppy disk.

5.9 Technical Support

If you are unable to solve difficulties with your accelerated Macintosh, you may wish to contact your dealer for technical support. Alternatively, Brainstorm Technical Support may be able to assist you. Brainstorm Products may be reached between 8:30am and 5:30pm PST at (415) 964-2131. The Fax number is (415) 964-2135.

You can save time and money if you read through the preceding sections of this chapter before consulting technical support services. Often when you describe your symptoms to them, they will have to ask you to run some of the tests described in this chapter. In many cases you will be able to solve the problem without assistance, by using the information in the preceding sections.

When contacting technical support, please use the checklist on the following page.

Technical Support Checklist

Please attempt to have the following information at hand when you contact your dealer or Brainstorm Technical Support.

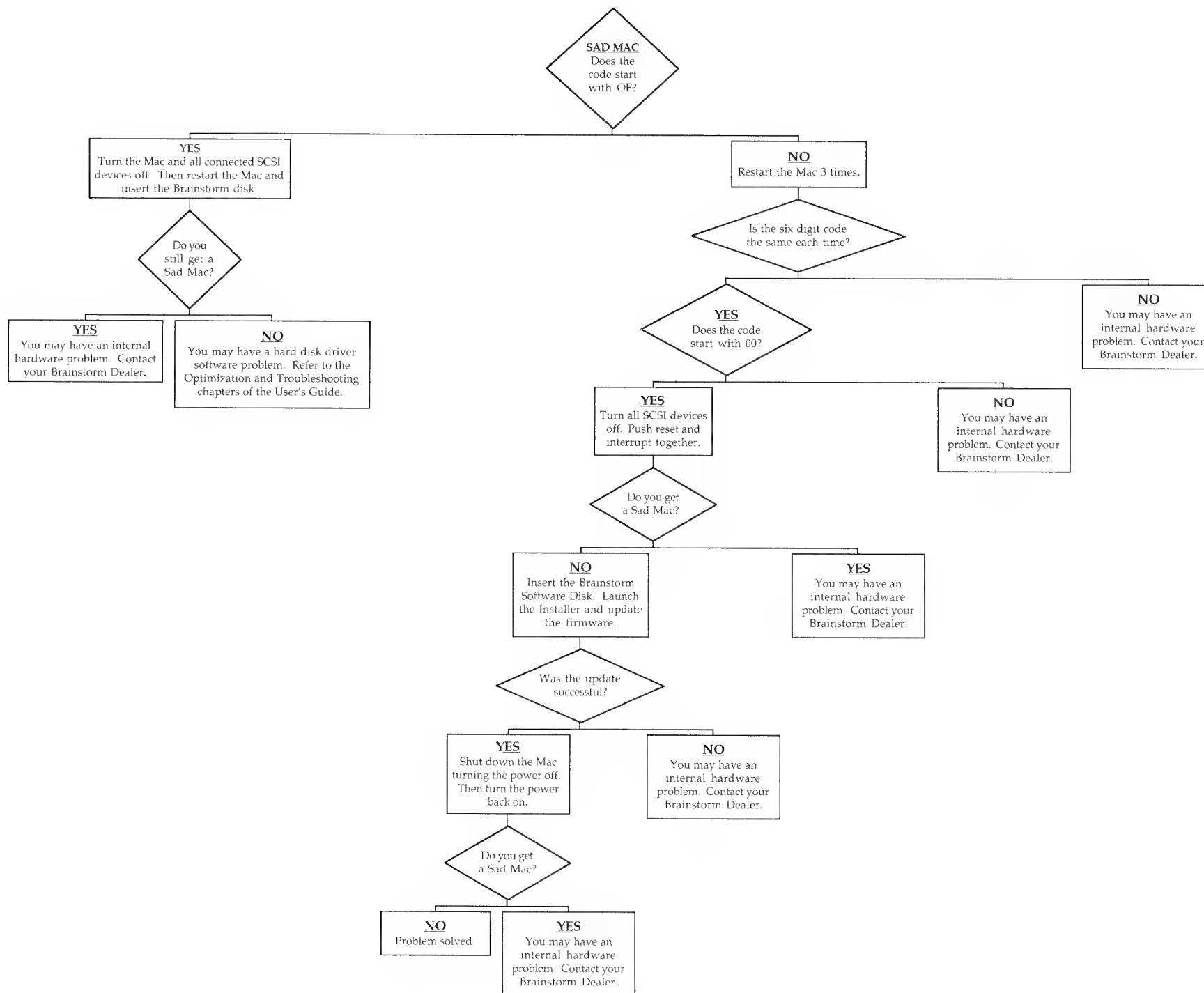
- ☐ A description of the problem, and whether it is reproducible.
- ☐ Product Designation: Brainstorm Accelerator.
- ☐ Macintosh Model.
- ☐ Amount of RAM installed, available in the **About the Finder** window under System 6, or the **About This Macintosh** window under System 7. See Figure 1-3.
- ☐ If you get a Sad Mac display, please note all six digits of the error code, and test whether they remain the same when restarting the Mac three times.
- ☐ System Software version, available in the **About the Finder** window under System 6, or the **About This Macintosh** window under System 7. See Figure 1-3.
- ☐ Application software version(s).
- ☐ Hard disk manufacturer and size.
- ☐ SCSI IDs and termination, if available.
- ☐ Network and printer types.
- ☐ Brainstorm Control Panel Status lines.

It is helpful to be near the problem Mac when you call.

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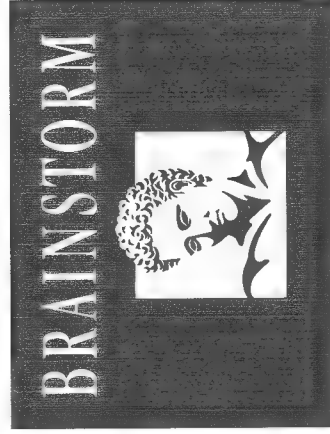
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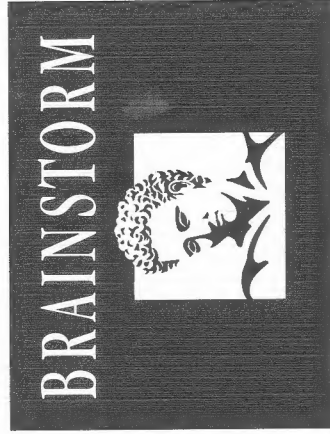
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